

19 Federal Republic of Germany
German Patent Office

12 Disclosure Document

10 DE 3702615 A1

51 Int. Cl. 4: C 14 C 11/00

C 09 D 3/72

C 08 G 18/66

B 05 C 1/08

B 05 D 7/12

// C08G 18/32, 18/36,

18/42, 18/48, 18/75,

D06N 3/18

21 File Number: P 37 02 616.1

22 Date of Application: January 29, 1987

43 Date of Disclosure: August 11, 1988

71 Applicant:

Henkel KgaA, 4000 Düsseldorf, DE

72 Inventor:

Höfer, Rainer, Dr., 4000 Düsseldorf, DE; Friese,

Hans-Herbert, Dr., 4019 Monheim, DE; Grützmacher,

Roland, 5602 Wülfrath, DE; Kaendl, Gerhard, 4010

Hilden, DE

54 Coating and finishing agents for leather

The invention refers to a coating and finishing agent for leather based on aqueous polyurethane dispersions, a procedure for the application of coating and finishing agents according to the invention and their use with coating and finishing of leather and leather substitute materials, whereby polyurethane dispersion consists of polyesterpolyols, oleochemical polyols, if necessary polyetherpolyols and dihydroxy and/or diamino compounds holding anionic groups as well as organic di-isocyanates.

DE 37 02 615 A1

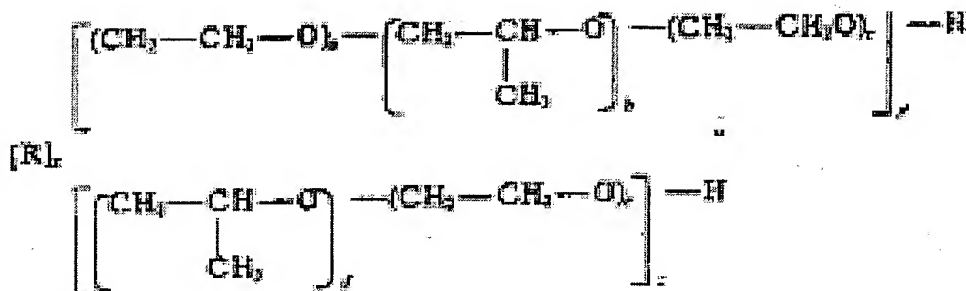
Patent claims

1. Coating and finishing agents for leather based on aqueous polyurethane dispersions with a solids content of 10 to 50% and viscosity in the range of 10 to 50,000 mPa-s, characterized in that the polyurethane dispersion consists of
 - (a) 40 to 200 parts by weight, based on 100 parts by weight isocyanate component, of a polyesterpolyol,
 - (b) 6 to 60 parts by weight, based on 100 parts by weight isocyanate component, of an oleochemical polyol,
 - (c) 0 to 12 parts by weight, based on 100 parts by weight isocyanate component, of a polyetherpolyol,
 - (d) 5 to 35 parts by weight, based on 100 parts by weight isocyanate component, dihydroxy and/or diamino compounds having anionic groups and
 - (e) 100 parts by weight of an organic di-isocyanate.
2. Leather coating and finishing agents according to claim 1, characterized in that the polyurethane dispersion's viscosity is in the range of 10 to 5,000 mPa-s.
3. Leather coating and finishing agents according to claims 1 and 2, characterized in that polyesterpolyols are comprised of aromatic and/or aliphatic dicarboxylic acids as well as diols.
4. Leather coating and finishing agents according to claims 1 to 3, characterized in that polyesterpolyols are comprised of adipic acid and/or isophthalic acid and diethylene glycol, whereby the polyesterpolyols' hydroxyl number is less than 200 and preferably between 30 and 100, and the ester's acid number less than 12 and preferably less than 6.
5. Coating and finishing agents according to claims 1 and 2, characterized in that oleochemical polyol consists of

Triols or polyols with at least 10 C-atoms, generated by the addition of univalent alcohols with 1 to 8 C-atoms with epoxidized triglyceride oils, whereby addition products, purified if necessary, are brought to reaction with 2 to 4 C-atoms,

of castor oil alkoxylates with 0 to 50 ethylene oxide and/or 0 to 100 propylene oxide groups,

of ring opening products made from soy and/or linseed oil epoxides with methanol and of castor oil with 0 to 10 ethylene oxide and/or 0 to 20 propylene oxide groups.
6. Leather coating and finishing agents according to claims 1 and 2, characterized in that polyetherpolyol conforms to formula (I)



in which R stands for a trace of glycerol, trimethylolethane propane or polyglycerol with a degree of polymerization $x = 1$ to 6 and indices $y = (x - z + 2)$, $z = 0$ to 4, $a = 1$ to 15, $b = 20$ to 100, $c = 1$ to 15, $d = 20$ to 150 and $e = 1$ to 15, their measurements indicating that sums $(a + c + e) = 3$ to 40, $(b + d) = 40$ to 300 and $(c + e) = 1$ to 15 and that y has a value of at least 1.

7. Leather coating and finishing agents according to claims 1 and 2, characterized in that the dihydroxy and/or diamino compound holding ionic groups contains a group of carboxylate, sulfonate and/or ammonium and is preferably dimethylol propionic acid.
8. Leather coating and finishing agents according to claims 1 and 2, characterized in that organic di-isocyanate has been selected from the group of aliphatic di-isocyanates.
9. Leather coating and finishing agents according to claims 1, 2 and 8, characterized in that organic di-isocyanate has been selected from a group consisting of isophorone di-isocyanate, 4,4-methylene-bis-(cyclohexylisocyanate), hexamethylene-1,6-di-isocyanate and dimer fatty acid di-isocyanate.
10. Leather coating and finishing agents according to claims 1, 2, 8 and 9, characterized in that the organic di-isocyanate is isophorone di-isocyanate.
11. A procedure for the application of leather coating and finishing agents according to claims 1 to 7, characterized in that polyurethane dispersions are applied onto leather via roller application, sprayer, plush or casting machines, if necessary in aqueous dilution, and then dried in addition to being ironed well.
12. A procedure for the application of leather coating and finishing agents according to claim 11, characterized in that polyurethane dispersions are mixed with additives such as polyacrylates, colloidal casein, modified silicones, aqueous emulsions of natural and/or synthetic waxes, respectively wax ester, cellulose ester and PUR emulsions, anti-foam agents and pigment preparations in the known manner.
13. The use of leather coating and finishing agents according to claims 1 to 10 for the application of top coats and for the finish of leather and shapes based on leather substitute materials.

Description

The invention at hand refers to leather coating and finishing agents based on aqueous polyurethane dispersions, a procedure for the application of coating and finishing agents according to the invention, and their use with the coating and finishing of leather and leather substitute materials.

Different film-forming polymers are used for leather finishing.

DE-OS 33 44 354 describes the use of polyacrylates applied in their aqueous phase. Even today, nitrocellulose and acetobutyrate are of importance with final varnishing and appreciated for their high gloss and high fastness.

In the mid-fifties, polyurethane systems were introduced into the leather industry. Their importance has increased more and more due to their characteristics being based on the special structure of polyurethane. Until recently, polyurethane was applied to leather and leather substitute materials in the form of organic solutions (EP-PS 73 389 and JP-PS 6 01 04 118). However, due to economical and ecological considerations, there is great interest in eliminating the use of solvents entirely or partially and creating so-called "all-water" systems (P. Rothwell, Journal Society Leather Techniques and Chemistry 69, 105 [1984]).

DE-PS 31 39 966 refers to a process for the production of aqueous dispersions or solutions of polyurethane, with which external emulsifiers, which are modified and/or exhibit oligourethane, are dispersed and/or dissolved in water with terminal isocyanate groups via integral ionic groups and/or integral non-ionic hydrophile groups, are simultaneously or subsequently transferred into oligourethane holding amino groups, and expanded with di- or polyfunctional chain elongation agents. Dispersions or solutions obtained with this method are employed in the production of finishes and coatings of any flexible and non-flexible substrates.

DE-PS 29 31 125 describes a process for the production of fibrous porous material, which has been impregnated with polyurethane, specifically for the production of synthetic leather by impregnating at least part of the material with a dispersion of polyurethane containing no free isocyanate groups.

US-PS 34 12 054 describes the production of polyurethane, which can be diluted with water, by converting amine or ammonia with polyurethane containing free carboxylic groups. Such polyurethane, which can be diluted with water, may be used as surface coating agents and ink.

DE-PS 33 44 693 refers to aqueous solutions or dispersions of polyisocyanate-poly-addition products, chemically integral tertiary and quaternary ammonium groups on integral ethylene oxide units, which are located within terminal and/or side polyether chains, and polyester segments, which have been integrated via urethane groups and were introduced by integrating dicarboxylic acid polyesterpolyols. The polyurethane dispersions mentioned are used as adhesives or for the production of adhesives for any substrate, especially rubber.

DE-OS 34 17 265 describes aqueous coating and finish agents for (preferably PVC) shapes based on polyurethane dispersions, whereby polyurethane solids are comprised of polyesterpolyol, lower molecular diols and, if necessary, triols,

compounds having anionic groups and/or non-ionic polyoxyethylene segments, at least two different di-isocyanates and a polyamine for chain elongation. The current state of technology recommends polyetherpolyols, polyesterpolyols and polyetherpolyesterpolyols as reaction agents for the production of polyurethane dispersions. Such polyols are synthetically generated from crude oil, and therefore cannot be derived from regrowing, renewable raw material, which can be regenerated from natural sources. Due to ever more decreasing crude oil resources, there was therefore a need to use or include reaction agents, which are derived from natural sources and can thus be regenerated successively, for the production of polyurethane dispersions.

The invention at hand is therefore founded on the task of providing new leather coating and finishing agents based on aqueous polyurethane dispersions with a solids content of 10 to 50% and viscosity in a range of 10 to 50,000 mPa-s.

Another task of the invention at hand consists of providing new compositions of polyol components for use in the production of aqueous polyurethane dispersions and the accomplishment of the characteristics of leather and leather substitute materials, which are coated and finished with polyurethane dispersions, meeting all requirements regarding durability, specifically lower brittleness and high resistance to wet and dry abrasion, uniformity and gloss.

Another task of the invention at hand consists of providing coating and finishing agents for leather and leather substitute materials containing polyurethane solids, which are present predominantly or entirely in their aqueous phase and to apply them in their aqueous phase on the material to be coated or finished.

It is further the task of the invention at hand to obtain high values of fastness without employing technologically expensive irradiation equipment for UV cross-linking, which is hardly used in the leather industry, as requested in DE-OS 34 37 918 and, specifically, without employing toxicologically questionable aziridines for cross-linking. High values in fastness render them suitable coating and finishing agents for priming, for instance, and more specifically, however, for top coating. The collagenous fiber weaving of leather is different from any other weaving as it pertains to the type of interweavement but also the structure of individual fibers. While a certain regularity in interweavement can be identified, open fiber ends can be noticed and individual fibers can be singled out with any other fabric, collagenous connective tissue fibers are linked to each other and interwoven with each other criss-cross in all directions and dimensions such that no fiber beginnings or endings can be determined and fiber fragments cannot be isolated from each other without damaging each other (Fritz Stather, Gerbereichemie und Gerbereitechnologie, Akademieverlag, Berlin, Germany, 1967, page 24).

In addition, leather has higher stability than any heterogeneous substitute materials in nearly all areas of application. This is the case specifically with tensile strength, stitch tearing and extended tearing strength (Fritz Stather, loc. cit., page 728).

It was surprising to find that polyurethane dispersions with significantly better characteristics, which are especially suitable for the complex substrate of leather, can be obtained if multifunctional oleochemical polyols, i.e. polyols, which are derived from naturally-regrowing fat and oil raw substances and generated via chemical processes for the production of coating and finishing agents, are employed as reaction agents in the production of polyurethane dispersions.

Specifically preferred within the scope of the invention are oleochemical polyols with at least 3 functional OH-groups.

Therefore the subjects of the invention at hand are coating and finishing agents for leather, based on aqueous polyurethane dispersions with a solid contents of 10 to 50% and viscosity in the range of 10 to 50,000 mPa-s, characterized in that a polyurethane dispersion consists of

- (a) 40 to 200 parts by weight., based on 100 parts by weight isocyanate component, of a polyesterpolyol,
- (b) 6 to 60 parts by weight., based on 100 parts by weight isocyanate component, of an oleochemical polyol,
- (c) 0 to 12 parts by weight, based on 100 parts by weight isocyanate component, of a polyetherpolyol,
- (d) 5 to 35 parts by weight, based on 100 parts by weight isocyanate component, dihydroxy and/or diamino compounds having anionic groups and
- (e) 100 parts by weight of an organic di-isocyanate or a mixture of organic di-isocyanate.

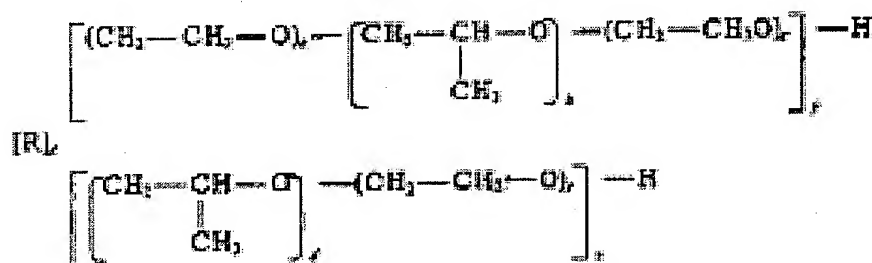
The viscosity of leather coating and finishing agents according to the invention based on aqueous polyurethane dispersions is customarily in the range of 10 to 50,000 mPa-s. According to a preferred design example, coating and finishing agents for leather are provided based on aqueous polyurethane dispersions with a viscosity in the range of 10 to 5,000 mPa-s.

For purposes of the invention at hand, polyesterpolyols are customarily comprised of aliphatic and/or aromatic dicarboxylic acids such as diols. Aliphatic dicarboxylic acids for purposes of the invention are, for instance, succinic acid, adipic acid, suberic acid, azeleic acid, sebasic acid, brassylic acid or dimer fatty acids. Aromatic dicarboxylic acids are phthalic acid, isophthalic acid, terephthalic acid, tetrahydrophthalic acid. Isophthalic acid is used as a preferred aromatic dicarboxylic acid and adipic acid as a preferred aliphatic dicarboxylic acid. For purposes of the invention, diols are ethylene glycol, propane diol-1.2, propane diol-1.3, diethylene glycol, butane diol-1.4, hexan diol-1.6, decan diol-1.10, dimerocanol (Sovermol® 650 NS, Henkel KgaA), neopentyl glycol or various isomeric bishydroxymethyl cyclohexanes. The dicarboxylic acids mentioned are customarily esterified with diols. A preferred polyesterpolyol is created by esterifying

isophthalic acid and/or adipic acid with diethylene glycol. According to a preferred design example of the invention at hand, polyesterpolyols exhibit a hydroxyl number of less than 200. Specifically preferred are polyesterpolyols whose polyester's hydroxyl number is 30 to 100. According to one design example of the invention at hand, polyesterpolyols have an acid number of less than 12 and preferably an acid number of less than 6. Specifically preferred are polyesterpolyols, which are comprised of adipic acid and/or isophthalic acid and diethylene glycol, where the polyesterpolyols' hydroxyl number is less than 200 and preferably 30 to 100, and the ester's acid number is less than 12 and preferably less than 6.

For purposes of the invention at hand, oleochemical polyols are comprised of triols and polyols with at least 10 C-atoms. They are generated by adding univalent alcohols with 1 to 8 C-atoms to epoxidized triglyceride oils, whereby addition products, which have been purified if necessary, are reacted with alkylene oxides with 2 to 4 C-atoms. An additional design example of the invention at hand describes coating and finishing agents characterized in that oleochemical polyol consists of castor alkoxylates with 0 to 50 ethylene oxide and/or 0 to 100 propylene oxide molecules per molecule castor oil. According to another preferred design example of the invention at hand, oleochemical polyols are understood to be ring opening products made from soy or linseed oil epoxides with methanol as well as castor oil with 0 to 10 ethylene oxide and/or 0 to 20 propylene oxide molecules per mole ring opening product.

If necessary, coating and finishing agents for leather according to the invention based on aqueous polyurethane dispersions may contain up to 12 parts by weight of polyetherpolyols, based on 100 parts by weight of the isocyanate component. For leather coating and finishing agents, it is preferable to use polyetherpolyol, which is equivalent to formula (I)



in which R stands for a trace of glycerol, trimethylol propane, trimethylol ethane or polyglycerol with a polymerization degree $x = 1$ to 6 and indices $y = (x-z+2)$, $z = 0$ to 4, $a = 1$ to 15, $b = 20$ to 100, $c = 1$ to 15, $d = 20$ to 150 and $e = 1$ to 15 indicating with their measurement that sums $(a+c+e) = 3$ to 40, $(b+d) = 40$ to 300 and $(c+e) = 1$ to 15 and y is at least 1.

Preferred are such block polymers, for which indices y are at least $= 2$, $a = 1$ to 5, respectively $d = 30$ to 100 and c respectively $e = 1$ to 5 and sum $(a+c+e) = 3$ to 15. Further, such block polymers, where R stands for a trace of glycerol or a trace of trimethylol propane, i.e. where $x = 1$, are particularly preferred. If R stands for a trace of glycerol, then glycerol, which was generated through fission of natural triglycerides' estering, is specifically preferred. Generally 2 to 3 hydroxyl groups are substituted with groups of ethylene glycol ether, i.e. y stands for 2 or 3 and z for 0 or 1 in block polymers derived from glycerol or trimethylol propane. Respective polyetherpolyols exhibit a hydroxyl number in the range of 25 to 40. Polyetherpolyols with R = glycerol or trimethylol propane for purposes of the invention at hand customarily have a molecular weight in the range of 1,000 to 20,000 and, preferably, in the range of 3,000 to 12,000.

Mono- and especially difunctional hydroxy or amino compounds exhibiting chemically fixated hydrophile groups, preferably for the purposes of isocyanate addition reactions, are known to contain groups of carboxylate, sulfonate and/or ammonium. According to one design example of the invention at hand, leather coating and finishing agents contain dihydroxy or diamino compounds having ionic groups and containing groups of carboxylate, sulfonate and/or ammonium. Preferably dimethylol propionic acid is used as the preferred dihydroxy compound holding ionic groups.

Customarily, aliphatic or aromatic di-isocyanates are used as the di-isocyanate, whereby their selection is strongly dependent on the subsequent method of use with aqueous polyurethane dispersions; if the resulting polyurethane is to be resilient to light and not tend to discolor, for instance to yellow, then aliphatic di-isocyanate should be used; if light resilience is not a factor, for instance because this property is of less importance in the use of the resulting polyurethane, then aliphatic as well as aromatic di-isocyanates may be used. As color fastness specifically is a primary requirement for leather coating and finishing agents, they are produced from organic aliphatic di-isocyanates. Customarily, aliphatic di-isocyanates are derived from the group of isophorone di-isocyanate, 4,4-methylene-bis-(cyclohexylisocyanate), tetramethylene-1,4-di-isocyanate, hexamethylene-1,6-di-isocyanate, cyclohexan-1,4-di-isocyanate, trimethyl-hexamethylene di-isocyanate and dicyclohexylmethane di-isocyanate.

For purposes of the invention at hand, leather coating and finishing agents are produced, characterized in that organic di-isocyanate is selected from a group comprised of isophorone di-isocyanate, 4,4-methylene-bis-(cyclohexylisocyanate), hexamethylene-1,6-di-isocyanate and dimer fatty acid di-isocyanate. Specifically isophorone di-isocyanate is preferred.

Another subject of the invention at hand is a procedure for the application of leather coating and finishing agents, characterized in that, if necessary, polyurethane dispersions are applied onto leather in aqueous dilution via roller

application, spray, plush or casting machines, and subsequently dried and ironed well as per the current state of technology.

In order to improve upon the properties of polyurethane dispersions in their use with coating and finishing agents, they may contain additional additives known from technology. Therefore a process for the application of coating and finishing agents characterized in that polyurethane dispersion is mixed in the commonly known manner with additives such as polyacrylates, colloidal casein, modified silicones with aqueous emulsions of natural or synthetic waxes, respectively wax ester, anti-foam agents and pigment preparations is also the subject of the invention at hand. If necessary, a mixture of water-dilutable cellulose ester, respectively additional PUR emulsions, is possible.

Another subject of the invention at hand is the use of leather coating and finishing agents for the application of top coats and the finishing of leather and shapes based on leather substitute materials.

The advantage of leather coating and finishing agents according to the invention at hand is specifically that particularly high fastness values are obtained without using toxicologically questionable aziridines or technologically expensive irradiation equipment for interweaving. Therefore coating and finishing agents for leather and leather substitute materials based on aqueous polyurethane dispersions are suitable for many applications in leather finishing, for example with priming, especially, however, with final coatings (top coat). The advantageous use of coating and finishing agents according to the invention lies specifically with the wet rub fastness of coated leather. Comparable values could thus far only be achieved with varnishes, especially solvent-dilutable varnishes or interweavement of aqueous polymer dispersions such as polyacrylate and polyurethane dispersions with polyaziridines.

Contrary to teachings of the current state of technology, for instance DE-OS 34 17 265, page 11, it was surprising to find that multifunctional oleochemical hydroxyl compounds can be used advantageously in preferred design examples with polyurethane dispersions for surface coating. While DE-OS 34 17 265 recommends to list trifunctional hydroxyl compounds under less preferred design examples, as there may be a risk that due to the use of trifunctional structural components partially insoluble parts may be generated, which make further processing of usable polyurethane dispersions nearly impossible, the invention at hand shows the opposite, that is specifically the use of multifunctional oleochemical polyhydroxy compounds, if necessary in combination with multifunctional block polymers based on glycerol and/or trimethylol propane.

It is surprising that due to the use of hydrophobic oleochemical polyols, which are a more hydrophobic component compared to the current state of technology, leveling agents are not necessary for surface coating. Due to the highly hydrophobic property of oleochemical polyols, it could be assumed that leather coating and finishing agents based on aqueous polyurethane dispersions according to the invention at hand would essentially require specifically leveling agents such as, for instance, agents containing alkoxyated dimethylpolysiloxane and/or water-soluble polyethylene oxide units. It was surprising to find that the leveling agents mentioned were dispensable with the use of oleochemical polyols according to the invention at hand, which is a significant advantage of the invention at hand compared to the current state of technology.

For the production of polyurethane dispersions suitable for purposes according to the invention, polyols and excess di-isocyanate are converted by generating polymer with terminal isocyanate groups. While suitable reaction conditions and reaction times as well as temperatures, depending on the respective isocyanate polyol, may be varied, these modifications are a matter of course for the professional. A professional knows that the reactivity of the components to be converted requires a certain balance between reaction speed and undesirable side reactions, which lead to discoloration and molecular weight reduction. Typically, reaction is accomplished within about 1 to 4 h by stirring at approximately 50 to 120°C.

General production instructions

In order to introduce carboxylic groups from the side, polymer is converted with terminal isocyanate groups with a molar excess of dihydroxy and/or diamino compound 1 to 4 h at 50 to 120°C, in order to obtain pre-polymer with terminal isocyanate groups. The acid is added preferably in form of a solution, e.g. as N-methyl-1,2-pyrrolidone or N,N-dimethyl formamid. The solvent for the acids typically does not amount to more than approximately 5% of the entire quantity in order to keep the portion of organic solvents in the polyurethane mixture as low as possible. After the polyol component of the dihydroxy and/or diamino compounds is converted with polymer, side carboxyl groups are neutralized at approximately 58 to 75°C for approximately 20 min. Chain elongation and generation of dispersion is achieved by adding water and stirring. Water-soluble diamine may be added to the water as an additional chain elongator, if necessary. Chain elongation includes the conversion of the remaining isocyanate groups with water, forming urea groups, and further polymerization of polymer material, whereby all isocyanate groups are converted by adding large stoichiometric excess of water. It is observed that polyurethane according to the invention is highly plastic, i.e. that it does not strongly harden further following its formation other than by adding additional hardening agents.

Water is used sufficiently in order to disperse polyurethane in a concentration of approximately 10 to 50 wt. % of solids and to obtain dispersion viscosity in the range of 10 to 50,000 mPa-s.

Polyurethane dispersions obtained in this manner may be used by themselves, and may, however, also be mixed with known additives such as aqueous polyacrylates, colloidal caseins as co-bonding agents, modified silicones, with aqueous emulsions of natural and synthetic waxes, respectively wax ester, in order to control water resistance, slide properties and block performance as well as additives, which are customary in leather finishing, such as anti-foam agents, leveling additives, matting agents and pigment preparations.

The following examples clarify suitability:

Production of polyurethane for polyurethane dispersions according to the invention

The production process consists of converting stoichiometric excess of di-isocyanate or a mixture of di-isocyanates with polyols, i.e. polyesterpolyols, oleochemical polyols, polyetherpolyols and dihydroxy and/or diamino compounds having anionic groups in the range of the indicated weight relationships to an intermediate with terminal isocyanate groups. A preferred design example of the process is that at first polyesterpolyols and oleochemical polyols or polyesterpolyols, oleochemical polyols and polyetherpolyols are converted with isocyanate to pre-polymer with terminal isocyanate groups; then the pre-polymer is reacted with the reactable hydrogen atoms of the compounds, which mediate solubility, and dihydroxy and/or diamino compounds holding anionic groups, in order to introduce ionic groups, which mediate solubility. Dihydroxy and/or diamino compounds, which mediate solubility, may be added in the form of salt and/or form of acid. Further, they may be neutralized during or after the generation of urethane. One design example of the process according to the invention is that polyetherpolyol is added entirely or partially only after or during the transfer to the aqueous dispersion.

Example 1

GT=parts by weight

Tested polyols:

Polyol I:	Polyesterpolyol, comprised of isophthalic acid, adipic acid and diethylene glycol, OH-number (OHZ) 60, acid number = 2
Polyol IIa:	Oleochemical polyol, ring opening product of linseed oil epoxide with methanol, converted with 3 mole propylene oxide
Polyol IIb:	Oleochemical polyol, ring opening product of soy oil epoxide with methanol, OHZ 225
Polyol IIIa:	Polyetherpolyol for the purpose of the invention based on trimethylol propane, OHZ 39
Polyol IIIb:	Polyetherpolyol for the purpose of the invention based on natural glycerol, OHZ 29
Polyol IV:	Dimethylol propionic acid

	Example I		II	
	Component			
	GT	%	GT	%
A Polyol I	168,70	20,21	168,62	20,10
B Polyol IIa	28,55	3,42	28,44	3,39
C Polyol IIIa	-	-	4,19	0,50
D Polyol IV	27,05	3,24	27,10	3,23
E N-methylpyrrolidone	40,48	4,85	40,52	4,83
F Hexamethylene di-isocyanate	100,00	11,98	100,00	11,92
G N-methylmorpholine	22,29	2,67	22,32	2,66
H Water		53,63		53,63

	Example III		IV	
	Component			
	GT	%	GT	%
A Polyol I	164,50	18,70	168,72	19,42
B Polyol IIa	26,82	3,05	28,58	3,29
C Polyol IIIa	7,83	0,89	2,95	0,34
D Polyol IV	27,09	3,08	27,02	3,11
E N-methylpyrrolidone	40,46	4,60	40,57	4,67
F Hexamethylene di-isocyanate	100,00	11,37	100,00	11,51
G N-methylmorpholine	22,81	2,48	24,50	2,82
H Water		55,82		54,83

	Example V		VI	
	Component			
	GT	%	GT	%
A Polyol I	127,69	19,46	127,62	19,36
I Polyol IIb	21,59	3,29	21,56	3,27
K Polyol IIIb	-	-	3,16	0,48
D Polyol IV	20,47	3,12	20,50	3,11
E N-methylpyrrolidone	30,64	4,67	30,65	4,65
L Isophorone di-isocyanate	100,00	15,24	100,00	15,17
G N-methylmorpholine	16,86	2,57	16,88	2,56
H Water		51,64		51,39

	Example VII		VIII		IX	
	Component					
	GT	%	GT	%	GT	%
A Polyol I	124,41	18,04	127,68	18,73	159,52	17,85
I Polyol IIb	20,28	2,94	21,61	3,17	26,99	3,02
K Polyol IIIb	5,93	0,86	2,25	0,33	2,77	0,31
D Polyol IV	20,48	2,97	20,45	3,00	25,56	2,86
E N-methylpyrrolidone	30,62	4,44	30,67	4,50	38,45	4,30
L Isophorone di-isocyanate	100,00	14,50	100,00	14,67	100,00	11,19
M Dimer fatty acid di-isocyanate	-	-	-	-	69,97	7,83
G N-Methylmorpholine	16,48	2,39	18,54	2,72	23,06	2,58
H Water		53,85		52,87		50,06

Application examples

Wt. relationship = weight relationship

NC emulsion = nitrocellulose emulsion

According to example VIII

with polyacrylate 20/30 wt. relationship	200
NC-emulsion	100
Matting agent	100
Water	200

Spray applicator 2 times, mill leather, spray applicator 1 time

Luster

Matting agent	50
Wax and silicone dispersion	115
Water	200

The physical fastness demanded of furniture leather finishes is achieved with this finish, which contains hardly any solvent.

Rub fastness according to Veslie (DIN 53339/IUF 450)

Dry felt	1,000 rubs, no damages
Wet felt	300 rubs, no damages

Permanent bend performance in the Bally flexometer (DIN 53351/IUP 20)

Dry	100,000 buckles, no damages
Wet	20,000 buckles, no damages

Example 2

Shoe top leather finishing (Softy)

Priming Applicator composition (wt.-parts)

Pigmented NC emulsion	150
NC emulsion (colorless)	50
PUR dispersion, fine, very soft	5
Cationic PUR dispersion	20
Water	150

Spray applicator 2 times, iron leather with Finiflex at 100°C, spray applicator 2 times

Finish

Combination PUR dispersion according to example V/polyacrylate

Dispersion 70/30/ wt. relationship	100
Solution based on wax	10
Water	100

Spray applicator 2 times, mill leather and iron with Finiflex at 100°C.
The fastness required for shoe top leather was achieved.

Rub fastness according to Veslie (DIN 53339/IUF 450)

Dry felt	150 rubs, no damages
Wet felt	100 rubs, no damages

Permanent bend performance in the Bally flexometer (DIN 53351/IUP 20)

Dry	50,000 buckles, no damages
Wet	20,000 buckles, no damages

Example 3

Shoe top leather

Priming	Applicator composition (wt. parts)
Aqueous pigment preparation	100
Polyacrylate dispersion	300
Matting agent	20
Wax dispersion	30
Water	400

Spray applicator 2 times, establish leather pores, spray applicator 2 times.

Finish

PUR dispersion according to example VI	70
Polyacrylate dispersion	30
Filler based on wax	5
Water	100

Spray applicator 2 times.

With the help of this finish, the required physical fastness properties for shoe top leather are achieved without the use of solvents.

Rub fastness according to Veslie (DIN 53339/IUF 450)

Dry felt	150 rubs, no damages
Wet felt	100 rubs, no damages

Permanent bend performance in the Bally flexometer (DIN 53351/IUP 20)

Dry	50,000 buckles, no damages
Wet	20,000 buckles, no damages

Example 4

Garment leather made from cowhide

Priming	Applicator composition (wt. parts)
---------	------------------------------------

Aqueous pigment preparation	40
Polyacrylate dispersion	200
Matting agent	25
Water	450

Spray applicator 3-4 times.

Finish

Polyurethane dispersion according to example IX	100
Matting agent	50
Water	150

Spray applicator 2 times, mill leather, spray luster.

With the help of this finish, the required physical fastness properties for garment leather are achieved without the use of solvents.

Rub fastness according to Veslie (DIN 53339/IUF 450)

Dry felt	100 rubs, no damages
Wet felt	50 rubs, no damages

Permanent bend performance in the Bally flexometer (DIN 53351/IUP 20)

Dry	100,000 buckles, no damages
Wet	50,000 buckles, no damages